German Economic Team in Belarus

76 Zakharova Str., 220088 Minsk, Belarus. Tel./fax: +375 (17) 236 1147, 236 4395
E-mail: bmer@ipm.by. Internet: http://research.by/

PP/10/05

Guidelines for Renewable Energy Policy in Belarus

Summary

In this paper we discuss the role that renewable energy sources (RES) can play in a sustainable energy policy in Belarus, and the opportunities and threats that are posed by RES policy.

RES could contribute to increasing energy security in Belarus. While increasing energy efficiency is clearly of paramount importance, increased use of RES has the potential to contribute to reduced dependence on imported sources of energy. RES have the added advantage of providing environmental benefits that are not only intrinsically important but might also generate tangible economic benefits for Belarus via the Kyoto Protocol. Finally, RES provide interesting opportunities in particular for agriculture and rural areas.

However, developing the full potential of RES in Belarus is a long term proposition. It will require considerable investment in research, generating facilities and infrastructure. The key challenges that must be faced are primarily economic and less technical in nature. With few exceptions, RES are more expensive than traditional fossil fuels. The combination of climbing international energy prices and continued technological progress in harnessing RES are increasing the relative competitiveness of RES. Nevertheless, RES will not provide 'cheap' energy.

Policy can foster the development of RES, but policy makers must avoid a number of pitfalls. In particular, support must be of limited duration and flexible in nature to avoid 'locking in' varieties of RES and particular technologies that may appear promising today but could just as well end up being supplanted by other varieties and new technologies in the future. While RES development could have a positive impact on agriculture and rural areas, RES development should not be used as an excuse for providing farms with inefficient subsidies. Finally, other countries, for example in the EU, have a head start on Belarus when it comes to research and development in the area of RES. Belarus would be well advised to join existing international networks to benefit from this experience.

Contents

1. Introduction

According to *The Concept of Energy Security of Belarus*, "Energy security is one of the most important components of the national and economic security".[1] With the goal of increasing energy security, it is planned to increase the share of own energy sources in the country's fuel balance from roughly 16.7% in 2003 to 25% in 2020. Own energy sources include domestic reserves of oil, gas, coal and peat, as well as renewable energy sources (RES) such as hydropower, biofuels and solar power.

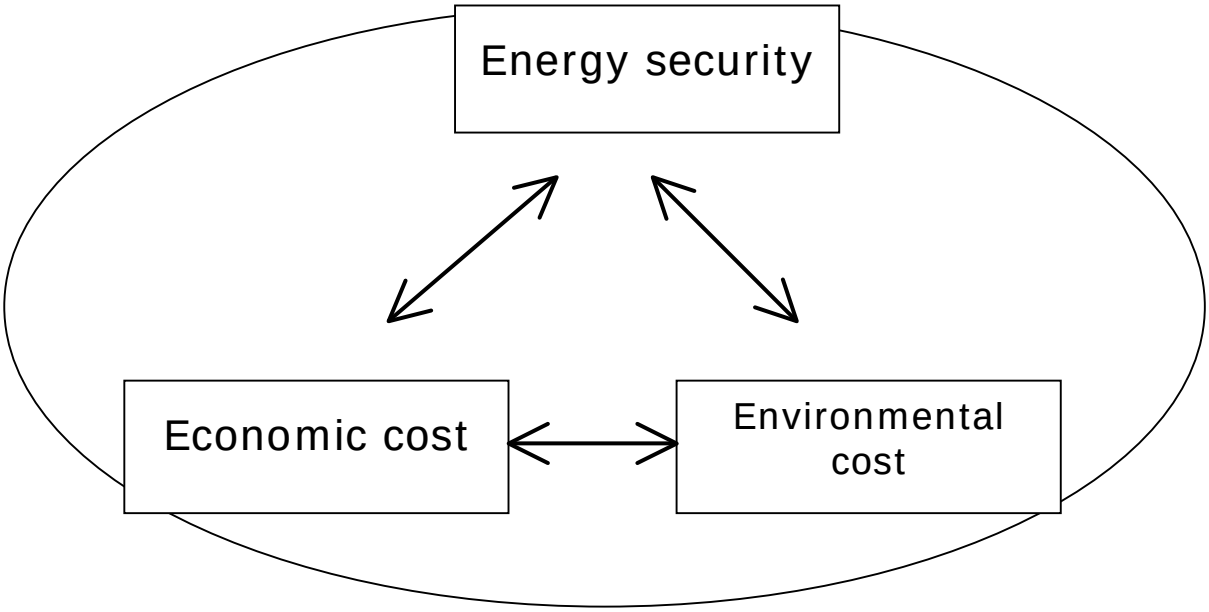
What role can RES play in the pursuit of these goals in Belarus, and what policy measures should be implemented to ensure that RES makes the best possible contribution? In the following we discuss these questions and make several recommendations for RES policy in Belarus. It is assumed that the reader is familiar with RES in general and the main different types of RES; information on this and on RES policy in the EU can be found in a GET background paper entitled "*Renewable energy resources: The past, present and future*". The reader should be warned that making firm forecasts and recommendations in the area of RES is very difficult because prices, technologies and institutions in this area are undergoing major changes. Indeed, one of the most important recommendations that can be made is that RES policy should be flexible to allow Belarus to profit from whatever developments the future does hold.

2. RES in Belarus

2.1. Fundamentals

There are three main criteria by which an energy source can be judged (Figure 1). These are political (does the energy source contribute to energy security?), economic (how much does the energy source cost in comparison with others?), and environmental (what environmental costs are associated with the use of an energy source – for example greenhouse gas emissions, destruction of biotopes?).

Figure 1. Criteria for judging an energy source



Source: Own depiction.

[1] The state program "The Concept of Energy Security of Belarus in 2006-2010", approved by the Decree of president #399 on 25.08.2005.

The interactions between these different criteria are complex. The only certain way of making progress in all three directions simultaneously is to increase energy efficiency. It has been amply documented that the Belarusian economy (like that in other states of the Former Soviet Union) has an exceptionally high energy intensity.[2] Reducing this intensity would, *ceteris paribus*, increase energy security, reduce energy costs and reduce environmental damage.

All other possible courses of action – for example, increasing the use of local fuels such as peat, increasing domestic nuclear power generation capacity[3], or increasing the use of RES – will lead to gains in some dimensions, but not all. Peat, for example, is domestically produced, so increased use of peat can increase energy security (as long as stocks last). However, peat is not a particularly clear fuel, and peat deposits are often valuable biotopes, the destruction of which leads to environmental damage. Hence, increased use of peat leads to a clash between energy security and environmental goals. Such clashes between energy security, economic and environmental considerations must be dealt with when choosing the best possible energy strategy for Belarus.

RES can lead to significant environmental benefits (primarily reductions in greenhouse gas emissions), although these benefits do vary widely among the various types of RES (see background paper). RES can also contribute to energy security, although it is important to recognise that renewable sources of energy are not necessarily domestic. Biodiesel or bioethanol, for example, could be imported and need not necessarily be produced in Belarus. Indeed, it may be the case that some imported RES are less expensive than domestic RES, for example because foreign producers enjoy natural advantages (e.g. the sun shines stronger and longer in Brazil than in Central Europe), or because they have gained a technological or scale advantage compared with Belarus.

Of course, just because an energy source is imported does not mean that it reduces energy security. Increased dependence on imported RES could improve energy security vis-à-vis the current situation if it leads to a diversification of Belarus' sources of imported energy. Energy security could climb even though energy self-sufficiency remains constant, if diversification reduced the current dependence on a single or few dominant sources of energy imports. Hence, possible trade-offs between energy security and economic costs should be taken into consideration, and it would be taking an overly narrow view to equate energy security with avoiding imports at all costs.

While the use of (domestic or imported) RES could clearly improve energy security in Belarus, the key question is: At what economic cost? RES are generally (hydroelectric power generation where the natural conditions are given is an important exception) more expensive than fossil fuels. This balance is shifting as fossil fuel prices increase, improved technologies for RES use are developed, and economies of scale in RES generation are realised. The balance would be further shifted if market prices for different sources of energy better reflected the environmental costs associated with their use. It is safe to assume that fossil fuels would be considerably more expensive if their environmental costs (climate change due to greenhouse gas emissions, the costs of oil spills, political conflict that is linked to attempts to control global oil and gas reserves) were included in their prices. This would improve the competitiveness of RES,

[2] For a detailed discussion of the energy intensity of the Belarusian economy, see Pavel and Tochitskaya: "Improving the Energy Efficiency of the Belarusian Economy", presented at the conference *Energy in Belarus: The Way Ahead*, Minsk, November 2, 2005.

[3] "The Economics of Nuclear Power Development in Belarus" is discussed by Hirschhausen and Rumiantseva in a paper presented at the conference *Energy in Belarus: The Way Ahead*, Minsk, November 2, 2005.

subject, again, to the differences in environmental benefits among the various types of RES.

The Kyoto Protocol and the provisions in it for trading in emission certificates as well as so-called Joint Implementation (JI) projects represent a step towards the monetary valuation of environmental benefits and, hence, a truly comprehensive basis for the comparison of energy sources. There is large potential for Belarus to benefit from JI projects when investing in the renewable energy sector. Ukraine has already undertaken substantial steps to clarify JI policies and has initiated its first projects with other Annex B countries.[4] To ensure that this mechanism also benefits Belarusian RES projects, Belarus should implement necessary steps such as the introduction of a greenhouse gas Emissions Accounting System soon.[5]

2.2. The potential for RES in Belarus

In 2003, RES contributed 0.4 to the total of 4.2 million tons of coal equivalent from domestic energy sources consumed in Belarus.[6] Hence, RES accounted for 9.5% of energy consumption from domestic sources, and 1.6% of primary energy consumption. By 2012 these shares are projected to increase to 11.1% and 2.9%, respectively, as consumption of RES increases to 0.75 million tons of coal equivalent.

According to the IEA, the worldwide share of RES in primary energy consumption was 13.4% in 2002 (see background paper). However, this is not the relevant comparison for Belarus, as the worldwide average includes developing countries with their characteristic energy supplies. More relevant for Belarus are the EU-15 and the Former Soviet Union, with RES shares in primary energy consumption of 5.7 and 3%, respectively. Compared with these two, Belarus' current level of 1.6% and the projected 2.9% in 2012 are quite modest.

Table 1 presents information on the potential for various types of RES in Belarus as well as projected use in the years 2006-2010 according to the Belarusian State Energy Program.

Table 1: Potential and projected use of selected RES in Belarus

The kind of RES	Potential stocks	The annual amount of use				
		2006	2007	2008	2009	2010
Wood (mill. tons of coal eq.)	6.6	2.08	2.32	2.57	2.82	3.06
Hydropower (tsd. kWh)	2270	36	120	227	327	390
Wind potential (mill. kWh)	2400	3.04	3.94	6.62	6.62	6.62
Biogas (tsd. tons of coal eq.)	1620	-	6.6	13.2	19.8	26.4
Solar (tsd. tons of coal eq.)	71000	0.01	0.3	1.0	2.0	3.0
Utility waste (tsd. tons of coal eq.)	470	-	4.9	9,9	14.8	19.8
Phytomass (tds. tons of coal eq.)	640	1,0	12.4	24.7	37.1	49.4
Lignin (tsd. tons of coal eq.)	983	37.2	45,0	45.0	45.0	45.0
Ethanol & biodiesel (tsd. tons of coal eq.)	1000	-	0,5	4.9	9.9	14.8

Source: The Belarusian State Energy Program, Minsk, 2005.

Estimates of potential and projections must be interpreted with caution, because they can vary widely depending on the assumptions made. Our own calculations based on national cattle and swine herds of roughly 4 and 3 million animals respectively, suggest that Belarus could by very conservative estimate produce 1.8 billion m^3 of biogas per year from manure, for a potential of 33.6 PJ of energy or roughly 0.8 million tons of coal equivalent. Burning the straw from 1.9 million hectares of crop land could pro-

[4] For more info about Ukrainian JI projects, see the Climate Change Initiative Webpage http://www.climate.org.ua/projects/inv_projects.html or the Scientific Engineering Centre "Biomass" Webpage http://www.biomass.kiev.ua/.

[5] See Pavel and Tochitskaya: "Improving the Energy Efficiency of the Belarusian Economy", presented at the conference *Energy in Belarus: The Way Ahead*, Minsk, November 2, 2005.

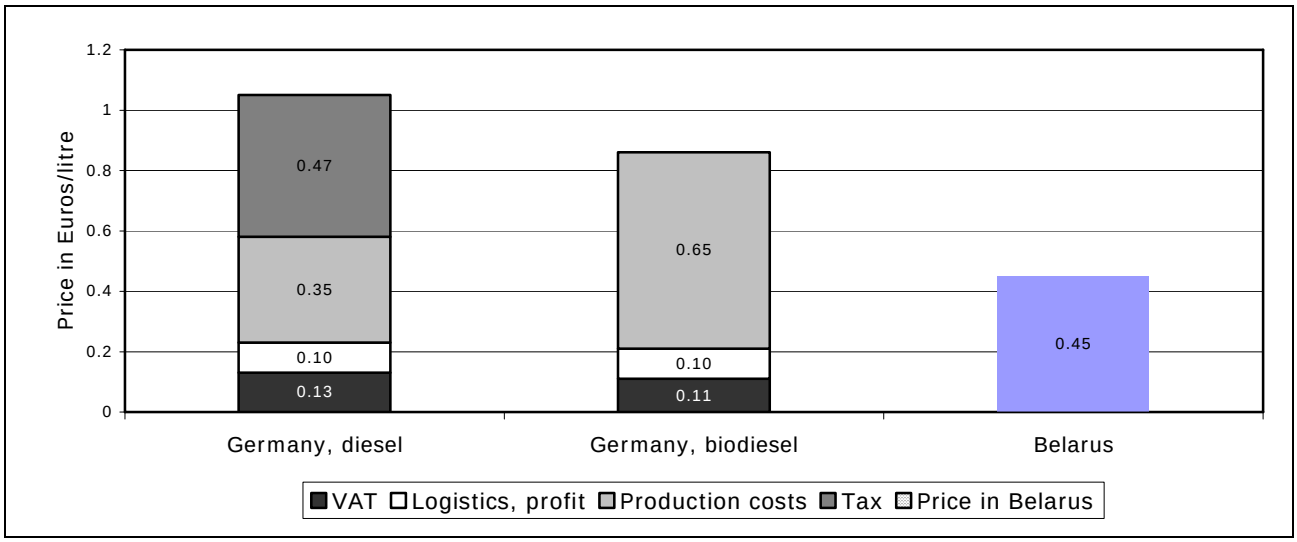
[6] Data provided by the Ministry of Energy of Belarus.

duce 44.3 PJ or 1.1 million tons of coal equivalent, assuming a yield of 23.3 GJ/ha (in Germany, with its higher crop yields, 70 GJ/ha are assumed).

What is much more important, however, are the concrete plans to realise potentials and projections. The major issues here are not technical but rather economic. First, developing RES requires investment not only in generating facilities but also in infrastructure for distribution and storage and, in some cases, in changes to the end-users of energy (for example, some diesel engines must be modified if they are to run on biodiesel). To date it is not clear how the funds required to finance existing plans will be made available. Second, as long as RES is more expensive than conventional sources, consumption must be subsidised as well.

To illustrate this second point, consider the example of biodiesel and the situation in the EU. As discussed in the background paper on RES, biodiesel is exempt from special energy taxes in Germany. The situation in France is similar, where biodiesel qualifies for a tax rebate. This rebate costs the French government an estimated 123 million Euros (the corresponding estimate for Germany is roughly 350 million Euros). The French government has recently announced its intention to triple its biodiesel production between 2004 and 2007. To meet this goal, the production of rapeseed for biodiesel in France will have to more than double over the same period, and the costs of the tax rebate will climb to an estimated 1,2 billion Euros by 2010.[7] As illustrated in Figure 2 for Germany, as a result of the tax exemption and, hence, the tax revenue that the government forgoes, biodiesel is competitive – even though it costs more to produce than conventional diesel. It comes as no surprise, therefore, that the market for biodiesel in Germany, as in France, is booming.[8]

Figure 2. The composition of consumer prices for diesel fuel in Germany



Source: Bergmann and Lakemeyer (2005); calculations based on prices for 2004 in Germany, current price of diesel in Belarus.

As also illustrated in Figure 2, diesel currently costs the equivalent of roughly 0,45 Euro/litre in Belarus. This is considerably less than the production costs of biodiesel, estimated at 0,65 Euro/litre in Germany. If biodiesel could be produced in Belarus at the same cost as in Germany, and without considering taxes, logistics and profits, a purely production cost-based litre of biodiesel would cost roughly 0,20 Euro more than Belarusian consumers are currently paying for conventional diesel. This example illustrates that expanding the use of RES in Belarus will require either increasing conven-

[7] See United States Department of Agriculture (USDA) Foreign Agriculture Service GAIN Report Number FR 5002: *France Oilseeds and Products, New Incentives for Biofuel Production*, Washington DC, 2004.

[8] Indeed, in 2005, over one half of Germany's total rapeseed harvest will be used not for human consumption but rather to produce biodiesel. Similarly, France intends to.

tional energy prices to a level at which they approach the costs of RES, or directly subsidising RES production by corresponding amounts.

2.3. RES and agriculture

In many parts of the world, RES are increasingly being seen as a significant opportunity for agriculture. Many RES are produced using inputs (biomass, wood or locations for wind turbines) that agriculture is in a unique position to provide. As conventional energy prices increase and farm subsidies in many countries are reduced due to international trade agreements (WTO), farmers especially in the EU and North America are wondering whether their future might not lie as much in producing energy as in producing food.

There are indications that fossil fuel prices have already reached levels that make it more profitable to transform some agricultural products into energy than into food. For example, at current world market prices for sugar and with crude oil prices above 40 $/barrel, it makes more sense for many Brazilian producers to process their sugar cane into ethanol rather than sugar for human consumption. Similarly, at current oil prices, vegetable oil production is, at the margin (e.g. palm oil in South East Asia) being drawn into energy and away from food use.

While this may sound like good news for farmers who have been battling low prices and who would welcome any additional source of demand for their products, a word of caution is in order. To the extent that energy production draws significant amounts of agricultural resources away from food production, food prices, and with them problems of food insecurity, will increase. For net importers of food, such as Belarus, this would have a negative impact. Furthermore, agricultural markets are complex and full of unexpected linkages. A significant increase in the demand for biodiesel based on vegetable oils (from rapeseed or palm oil, for example) would also increase the production of the associated by-products (rapeseed meal, palm expeller). This would be good news for farmers who purchase these by-products as protein feeds for livestock production, but bad news for farmers who produce other types of protein feed.

There is some concern, that RES could be used as a new excuse for providing subsidies to agriculture. The result would be distortions on international markets for RES such as ethanol and biodiesel, instead of sugar and oilseeds. As discussed above, RES must not necessarily be produced domestically, and under some circumstances, RES can contribute to national energy security even if they are imported. If the production of RES in agriculture becomes as important as many expect, then it must be assumed that national policies that subsidise this production will be a topic of future international trade negotiations and subjected to appropriate disciplines. Countries would be well advised to avoid RES policies that are simply ways of providing indirect subsidies to farmers, and that will sooner or later be subject to international sanction. Production of RES should be based on the same principles of efficiency that food production ought to be based on, and farms that have failed to restructure, improve management techniques and increase efficiency in food production are likely to fail at producing energy as well.

RES could have an impact on agriculture not only as a potential supplier of energy, but also as a significant user. Farm and rural communities are often relatively remote, and the costs of supplying such communities with energy from conventional sources is often correspondingly high (infrastructure, transmission losses, etc.). At the same time, energy based on agricultural RES (biomass, manure, etc.) can be relatively inexpensive directly at its source. In parts of the EU, experience with decentralised energy generation in rural areas is being gathered. Some large farms are experimenting with heating systems based on wood pellets, or the use of rapeseed oil produced on the farm to fuel vehicles; recently an entire village in Germany has begun to imple-

ment a project that will make it completely able to completely cover its energy need with RES. It is too early to say which, if any, of these experiments will prove to be sustainable.

3. Policy challenges and recommendations

A. The first priority of an energy policy that aims to increase energy security in Belarus must be to reduce the energy intensity of the Belarusian economy. Steps in this direction would reduce dependence on imported energy, reduce the negative environmental impact of energy use and increase the overall competitiveness of the Belarusian economy. Before a single Ruble is invested in RES or any other domestic source of energy, the impact on energy security of investing that Ruble in increasing the efficiency of energy use in Belarus should be calculated first.

B. Consumer prices for energy in Belarus are generally below levels required to cover the full costs of energy provision[9], and they are certainly below the costs of RES. Hence, even though the gap between the costs of RES and the costs of fossil-based energy are closing due to increasing fossil fuel prices on world markets and technological progress with RES, increased RES use in Belarus would increase the cost of subsidising energy consumption. Any scheme for increasing the use of RES in Belarus must squarely face the question of how to finance these costs. The negative consequences for energy infrastructure of forcing suppliers to provide energy to consumers below cost are amply documented in Belarus. Investments in RES can only be expected if investors have a reasonable expectation of making profits.

C. An important advantage that RES have compared with other sources of energy is that RES can provide important environmental benefits such as reductions in greenhouse gas emissions. However, this advantage is not reflected in the relative prices of RES and other sources of energy; the prices of conventional energy sources do not reflect environmental costs that result from their use. The Kyoto Protocol contains provisions that could partially redress this imbalance. Belarus should implement its standards and mechanisms soon, so that RES projects in Belarus can benefit to the greatest possible degree.

D. There are many different means of providing state support for the development and use of RES. These range from supporting research and development into RES, to investment aids for the production and installing of facilities such as biogas units or wind turbines that generate energy based on RES, to outright subsidisation of energy produced using RES. The choice of a particular measure must be based on a transparent analysis and comparison of its costs and benefits.

E. RES technologies are changing rapidly. For example, due to technological advances, the annual energy output per wind turbine has increased 100-fold in 15 years, the weight of these turbines has been halved in 5 years and noise emission levels have been halved in 3 years. In the process, the cost of wind generated electricity fell from 0,35 €/kWh in 1980 to less than 0,05 €/kWh in 2004.[10] The prices of non-RES alternatives are also changing rapidly. Hence, there is no way of knowing today what technologies will prove competitive tomorrow. Some of these technologies may not even exist yet today. Policy makers should avoid measures that 'lock in' particular technologies that may turn out, in the course of time, to be uncompetitive. An example of such a policy to be avoided is Germany's EEG (see background paper) which guarantees specific prices for electricity generated using specific RES (wind, biogas,

[9] See Pavel and Tochitskaya: "Improving the Energy Efficiency of the Belarusian Economy", presented at the conference *Energy in Belarus: The Way Ahead*, Minsk, November 2, 2005.

[10] See EU Commission (2005): Energy RTD Framework Programme – "Success Stories" http://europa.eu.int/comm/energy/res/publications/doc/energy_rtd_success_stories.pdf

solar, etc.) over a long period of time. Policies to support RES should be strictly limited in time and subject to review at regular intervals.

F. Investment in research and development into RES should be increased significantly in Belarus. However, other countries, for example in the EU, have a head start in RES research and development, and have advantages especially in the large scale production of commercial RES technology. Belarus would be well advised not to 'reinvent the wheel' but rather to join and cooperate in existing RES research and development networks. This will enable Belarus to take advantage of advances that have been achieved elsewhere and to focus its efforts in areas in which it has special needs and expertise.

G. There are indications that fossil fuel prices have reached levels at which they act as a floor for some types of agricultural production. For example, at current fuel oil prices, vegetable oil production is, at the margin (e.g. palm oil in South East Asia) being drawn into energy and away from food use. While it is too early to do more than speculate, these developments could have a major impact on world food markets and price ratios in agriculture. Policy makers in Belarus would be well advised to follow these developments closely and to invest in expert analysis of their implications for domestic policy.

H. The development of RES can provide impetus to agriculture and rural areas. It can create new markets for agricultural products (for energy generation instead of or coupled with food production), and it could present interesting local, decentralised energy provision solutions for rural communities. However, the opportunities posed by RES should not be misused as a new excuse for old, inefficient agricultural subsidies. Production of RES should be based on the same principles of efficiency that food production ought to be based on, and farms that have failed to restructure, improve management techniques and increase efficiency in food production are likely to fail at producing energy as well.

Author: Stephan v. Cramon

Lector: Elke Lakemeyer.

November, 2005